NORTHEASTERN FOREST EXPERIMENT STATION

Division of Watershed Management Research

Semi-annual Report October 1959

GENERAL

Some six-month period we may have nothing to report; everyone real busy--but just nothing to say. Not so this period: With noses to the grindstones as we lead visitors around (our grindstones are portable) we ground out the following:

ELKINS RESEARCH CENTER

Treated Watersheds

Sufficient time has elapsed since logging the commercial clearcut watershed to show the seasonal pattern of increase in flow:

Increase in Streamflow After Start of Logging[1/]

		Growing Season (May - Oct.)	Dormant Season (Nov. - Apr.)
		Area Inches	
Water year 1957-8	(5/57-4/58)	1.3	0.9
Water year 1958-9	(5/58-4/59)	4.5	0.6

1/ Logging started May 15, 1957, was completed June 15, 1958.

The growing season increases are significant at the 5 percent level; the dormant season increases are not significant.

Sprouts and herbaceous growth are now very prolific in this watershed. This may explain why already the effect of treatment is apparently decreasing. Records for the first 3 months of this year's growing season have been worked up; increases in streamflow compared with those the year before are as follows:

Increase in Streamflow

	Area Inches	
	1958	1959
May	0.09	0.25
June	1.27	0.09
July	1.60	0.58

The comparison is complicated by the fact that precipitation in June and July of 1958 was far above that in the same months of 1959. Additional records will have to be obtained before the rate of recovery after logging can be determined more precisely.

Streamflow for July, 1959 gives a first comparison of the effects of the different cutting practices upon quantity of flow:

	Watershed Treatment			
	Commercial clearcut	Diameter limit	Extensive selection	Intensive selection
Volume removed MBF/A (cut and culled)	9.0	4.3	3.5	1.8
July increase in flow--area inches (measured flow minus predicted)	0.58	0.44	0.18	0.03
Increase in flow as percent of predicted flow	387%	244%	49%	12%

Increases for the commercial clearcut and diameter limit cut were significant at the 5 percent level; increases for the two selection cuts were not significant. However, a definite pattern is apparent.

Soil Moisture and Water Quality Sampling

Some soil-moisture measurements have been made this summer and water quality sampling is continuing. Analysis has not proceeded far enough for a report on these at this time.

Miscellaneous

A records storage vault adjacent to the Fernow office building is nearing completion. This is a welcome addition as our basic data is building up beyond the capacity of our fire-resistant file.

West Virginia had the pleasure this year of acting as host to the annual meeting of the Northeastern Forest Soils Conference at the Blackwater Falls State Park. One day was spent on the Fernow Experimental Forest looking at site work.

Ken Reinhart and Carl Barr held a training session and laid out a logging road on the Camp Dawson (West Virginia National Guard) watershed.

The past 6 months have brought a large number of group and individual visits to the Fernow Experimental Forest. During this period we have been host to approximately 575 people involved in about 50 show-me trips.

Carl Barr and Wilfred Mitchell held a training session on logging road location for West Virginia Conservation Commission personnel at the Greenbrier State Park.

Dick Trimble discussed the results of the Center's watershed research studies at the annual meeting of the West Virginia Chamber of Commerce at White Sulphur Springs.

Dick Trimble spent a day on the Smithfield, Pa. watershed with consulting forester Tom Clark appraising the risk to the watershed involved in prospective logging of the area.

LACONIA RESEARCH CENTER

Weir Construction

Our weir construction program entered a new phase when we placed construction of weir #4 in the hands of a contractor. An idealized shape and size of weir was designed to fit the surficial characteristics of the stream channel prior to intensive excavation. Realizing that the size and shape of the weir would very likely change depending on the topography, soil, and bedrock characteristics after excavation, the contract was arranged so the bidders based their price on a cubic yard basis for unclassified excavation, concrete, reinforcing steel, and rock retaining walls. Items such as the gage house and weir blade were bid on a lump sum basis. Although the weir by contract will cost more than constructing it ourselves, we feel the time saved for research activities may well be worth it. Excavation for the weir is done and the weir should be operating by the last of October.

Humus Studies

This summer, humus measurements were taken in cutting plots in the northern hardwood forest of the Bartlett Experimental Forest. The data, summarized below, point out a trend. Average depth of the H-layer of humus was greatest on the uncut plots--least on the clearcut plots. The soil type was a podzol with a distinct mor-type humus.

Plot	Treatment	Litter and humus depths (inches)		
		L	F	H
1	Selectively cut about 1875. Clearcut in 1935.	.32	.51	2.05
2	Selectively cut about 1875. 30 percent selection cut in 1934.	.70	.80	2.27
3	Selectively cut about 1875. Uncut.	.51	.72	2.33
4	Clearcut about 1875. Clearcut again in 1939.	.52	.50	2.35
5	Clearcut about 1875. 40 percent thinning in 1937.	.42	.44	2.95
6	Clearcut about 1875. Uncut.	.48	.41	3.37

The difference in H-layer between clearcut plot 4 and uncut plot 6, 1.02 inches, was significant at the 5 percent level. The difference between clearcut plot 1 and uncut plot was not significant. Plots 1-3 are at a higher elevation and steeper slope, than plots 4-6, and site quality is not as good.

Bark Color and Snow Melt

Snow ring melt around tree trunks is a common sight during the spring melt period. A study was made to determine if the color of tree bark influenced the rate of this snow melt. Measurements were made on 30 trees; 10 trees had boles painted black, 10 trees painted white, and 10 trees were unpainted. Results showed no significant difference in the size of snow melt rings between the black, white and unpainted trees. A distinct relationship was observed between rate of snow melt and size of stem--snow melt around large stems was greater than melt around small stems.

Suspended Sediment Sampler

Several automatic sediment samplers, developed on the Fernow Experimental Forest, were installed this summer. These samplers will enable us to obtain water samples at any predetermined stage height. Because most of the soils at Hubbard Brook are sandy, the peak load of suspended sediment occurs for only a short time and then drops out of suspension. By the time a man reaches the sampling point, the water has very likely cleared up. The St. Anthony Falls sampler is not very

efficient in turbulent streams; other samplers require electric motors and timers. The "Rube Goldberg" sampler described here can be made from readily available material.

A flume diverts a portion of the streamflow into a collecting device. This device consists of a one-inch hose attached to a quart plastic bottle, both strapped to a one-inch-wide board. This board is balanced from a pivot provided by a frame. When the apparatus is in sampling position the hose rests in the flume and water runs into the bottle. As the bottle fills, its weight tips the hose opening upward out of the flume. In the ready position, prior to sampling, the board, hose, and empty bottle are held from falling into the flume by a wire which leads to a simple trigger mechanism. This trigger is attached to a length of sail cord which leads by pulleys to a tripping bucket near the front of the weir pond. The cord is tied to the bucket, a five-quart can filled partly with cement that floats about one inch above the water. Taut vertical wires mounted adjacent to the side wall of the weir pass through vertical tubes soldered to the bucket. These wires permit the bucket to move up and down but not laterally. As the water rises during storms, the bucket floats up until it hits a stopper. This stopper is an adjustable metal rod which prevents the bucket from rising beyond a predetermined stage height. Since the bucket cannot rise past the stopper, water fills the bucket and it sinks to the bottom. This pulls the cord to the trigger and activates the sampler. (If you can't get this at first reading, we're writing it up with diagrams in a Station Paper).

With one sampling rig and tripping bucket, it is possible to obtain samples at different stages of flow merely by changing the height of the stopper. If samples are to be taken at several stages during one storm, a battery of samplers can be built, each sampling rig requiring its own tripping bucket. The tripping-bucket device is also used to raise trash screens away from the v-notch when the head reaches 0.2 feet.

Miscellaneous

Tony Federer, our student trainee for the past two summers, was graduated from the Forestry School at the University of Massachusetts in June as top man in his class. Tony has departed this fall to the University of Wisconsin where he will start graduate work for a Ph.D. in soil physics and meteorology.

Work has started on our soils laboratory in the basement of the Forestry Building in Laconia. The laboratory should be completed in the next few months.

We are now working out of three trailers set up on our administrative site at Hubbard Brook rather than the rented cottage we formerly occupied. One trailer is used as an office, a second as an overnight

bunkhouse, and the third is for storage. The barn (inherited with the administrative site property last fall) has been modified to serve as a garage and workshop.

We played host to five groups this summer: Agricultural Stabilization and Conservation Committee for New Hampshire, Dartmouth College ecology class, University of Maine foresters, Lost River conservation camp for teachers, and University of New Hampshire foresters.

Director Marquis and Bob Bain toured our field installations. Bill Reifsnyder of Yale Forestry School was here on a work visit advising us on our meteorological problems.

NEW LISBON RESEARCH CENTER

General

The transfer of watershed management activities from the Kingston Research Center to New Lisbon was more or less completed at the end of April. Irv Reigner arrived with some equipment, voluminous files, and a mass of data collected in the past 10 years in watershed work at Dilldown and at the Pocono Experimental Forest.

He was met by friendly Jerseyites and, unexpectedly, by a soil moisture study that Howard Lull and Si Little had just cooked up and installed. More on this later. Since then, Reigner has been familiarizing himself with his new location and with the two new cooperative projects, Baltimore and Newark Watersheds, that have become the responsibility of this Center. An invitation to join a group of ARS and SCS personnel in a trip through New Jersey was cheerfully accepted. The tour visited examples of soil and water conservation practices and research projects and was quite informative. The summer meeting of the Cranberry Growers Association, a group highly interested in water, was also very educational.

The Soil Moisture Study

Although most everyone realizes that the pine forest uses large quantities of water, this project will show how much it uses as compared with blueberry ground cover and with water losses from a bare area.

Four plots have been established in a young pine stand on the Lebanon Experimental Forest, close to the office. Four other plots are located nearby on which all vegetation has been removed. Gravimetric soil moisture sampling done frequently this summer measured the moisture extraction by each condition. Analysis of data is far from complete but as expected, the pine forest has used a significantly greater amount of water than was lost by evaporation from the bare area.

The study will continue for two more years with increasingly complex comparisons. Next year, some of the bare plots will be allowed to revegetate with blueberry and sedge groundcover, while the pine density will be decreased on some of the pine plots.

A series of groundwater wells has been established in the plot area to measure possible differences in groundwater level due to soil moisture or vegetation differences--and also to make certain that groundwater is not affecting soil moisture.

Newark Watersheds

As this summer was the initiation period for the new weirs, considerable effort was made to work out the bugs that always inhabit a new installation. Wing walls had to be constructed back of two of the weirs to prevent flow around the weir boxes in loose back fill. Smaller leaks at the third weir were recently discovered. We will probably try to correct this problem with bentonite.

The first exposure of the research watersheds and installation to public view will take place October 2. The N. J. Chapter of the Society of American Foresters will visit the Newark Watershed and will observe the research project.

Baltimore Watershed

The third Baltimore weir has recently been completed and is a radical departure from other weirs in the Northeast. Although it has a standard 120° V-notch sharp-crested blade mounted in a box similar to many others, the box is made of wood and is lined with a sheet of black vinyl film, 22 feet wide and 44 feet long. Lou Ningard, the Superintendent of the Baltimore watersheds, has always been sympathetic with our desire to develop a cheaper, simpler weir. Lou designed this box which can be constructed without heavy equipment, if necessary, and with materials which might be obtained in a back country area near a weir location.

Walter Sushko, the Baltimore watershed forester and Irv Reigner have prepared a manuscript describing the Baltimore watersheds, the management practices being carried on, and the research in progress. It is now being edited and will be submitted for publication to one of the conservation periodicals.

Dilldown Watershed

Although the calibration period of this study has been completed, a sizeable part of the watershed still has not been converted from scrub oak to high forest species. Thus, research is still continuing in a small way. It appears that subsequent conversions must be accomplished by

direct seeding, as the remaining area is too rocky to plant. In addition, the rock eliminates the possibility of mechanical site preparation.

As direct seeding almost certainly requires site preparation, the only obvious solution is some form of chemical treatment. A small trial was made last summer using a tractor mounted low-volume sprayer. Results of this test were not encouraging; a fair kill was obtained by the highest concentration, 4 lbs. of 2,4,5-T per acre in the tracks made by the crawler-type tractor. But from the results of the 1956 mistblower trials, better results could be obtained by a directed mistblower treatment.

PUBLICATIONS

A problem analysis and program for watershed management research in the White Mountains of New Hampshire. George R. Trimble, Jr. Northeastern Forest Expt. Sta. Paper 116, 46 pp., illus.

A soil survey of forest land. Lloyd E. Garland, Robert S. Pierce, and George R. Trimble, Jr. Jour. Soil and Water Conserv., 14: 199-204.

Manuscripts Submitted

Forested municipal watersheds in the Northeast. Howard W. Lull.

Soil moisture patterns in a northern coniferous forest. Thomas F. McLintock.

Frost and forest soil. Howard W. Lull and Robert S. Pierce.

Management of forested watershed lands for the City of Baltimore. Walter C. Sushko and Irvin C. Reigner

A time-scale corrector for use in adjusting streamflow charts. Raymond W. Lavigne.

The problem of stones in soil-moisture measurement. Kenneth G. Reinhart.

A simple filter for small streams. Kenneth G. Reinhart.